THE ASSOCIATION BETWEEN IMPULSIVITY AND EXERCISE IN ADOLESCENTS

A Senior Scholars Thesis

by

MADELINE RACINE

Submitted to Honors and Undergraduate Research
Texas A&M University
in partial fulfillment of the requirements for the designation as

UNDERGRADUATE RESEARCH SCHOLAR

May 2012

Major: Psychology

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ABSTRACT

The Association between Impulsivity and Exercise in Adolescents. (May 2012)

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Two separate constructs, impulsivity and exercise, have been studied extensively in past literature, identifying impulsivity with risk taking behavior and exercise with health and psychological benefits. The present study looks at both impulsivity and exercise by using laboratory behavioral assessments and self-report questionnaires to explore the relationship between impulsive behavior (impulsive decision-making, inattention, and disinhibition) and exercise in adolescents. Participants were male and female adolescents ranged in between 17 and 20 years. Inattention and disinhibition were found to be significant predictors of exercise. Adolescents who were more impulsive reported exercising more than adolescents who were less impulsive. These findings suggest that adolescents may use exercise as a way of regulating and counteracting their impulsive behaviors. Future research should be conducted to further examine the relationship between impulsivity and exercise in order to determine the effects exercise has on impulsivity.

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CHAPTER I

INTRODUCTION

Impulsivity is an important multifaceted personality trait that covers a wide range of cognitive, emotional and behavioral constructs. It is broadly defined as "human behavior without adequate thought, the tendency to act with less forethought than do most individuals of equal ability and knowledge, or the predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions" (International Society for Research on Impulsivity; http://impulsivity.org). Recent research using behavioral assessments to measure impulsivity provide evidence that impulsivity can be defined as at least three separate subtypes of behavior: decision making, inattention and disinhibition (Reynolds, Penfold, & Patak, 2008). Impulsive decision making requires that the individual decide between delayed versus immediate or probabilistic versus certain outcomes; inattention involves the inability to maintain alertness for a particular set of stimuli; and disinhibition involves the ability to inhibit inappropriate or unwanted behaviors (Reynolds et al., 2008). Because these subtypes have been found to effectively measure impulsivity when using laboratory behavior assessments in various studies (e.g., Fields, Collins, Leraas, & Reynolds, 2009; Reynolds et al, 2008), the current study will refer to these as the constructs of impulsivity. A variety of measures have been developed to access

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This thesis follows the style of *Experimental and Clinical Psychopharmacology*.

impulsivity. Most common measurements are laboratory behavioral assessments (objective measures using different laboratory behavioral tasks) and self-report questionnaires (self-perceptions of one's own behavior). These measures address separate constructs of impulsivity, but complement one another to generate a comprehensive analysis of impulsivity (Reynold, Ortengren, Richards, & de Wit, 2006). Impulsivity has gained a growing interest among researchers and clinicians in recent years as numerous studies have associated it with various risky behaviors and physiological disorders.

Recent research has begun to show a concern for impulsivity as it relates to risk taking behaviors in adolescents. Studies have found a correlation between substance abuse and impulsivity; specifically, college students high in impulsivity related traits have a high risk for excessive alcohol consumption, an increased probably of experiencing negative alcohol-related problems, and are more likely to engage in binge drinking (Smith et al., 2010; Marczinski, Combs, & Fillmore, 2007). Impulsivity has also been found to be involved in the process of drug dependence by marijuana (Johnson et al., 2010) and cocaine-dependent users (Coffey, Gudleski, Saladin, & Brady, 2003). In addition, adolescents who smoke cigarettes are more impulsive with respect to some types of impulsivity than are adolescents who do not smoke (e.g., Fields et al., 2009; Reynolds et al., 2008). Furthermore, impulsivity-related traits in adolescents predicted a greater increase in BMI across the adult life span (Sutin, Ferrucci, Zonderman, & Terracciano, 2011). Research has also found trait impulsivity to be a risk factor for pathological

gambling in adolescents (Petry, 2001) and sexual risk behavior in pre-teenage and teenage girls (e.g., Hayaki, Anderson & Stein, 2006; Hipwell, Keenan, Loeber, & Battista, 2010). Numerous literature focuses on impulsivity as a distinct personality factor that may contribute to the onset of depression and may put individuals at high risk for suicidal ideation and behavior (e.g., Hayaki et al., 2006; Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011). Much of this research has helped explain the link between impulsivity and risky behaviors in adolescents; however, little research has been conducted on specific methods to reduce impulsivity in these at-risk populations.

In addition to maintaining weight and reducing health risks, exercise has been found to have numerous psychological benefits across an individual's lifespan. In a cognitive study of overweight children, physical activity was found to enhance aspects of children's mental function that are central to cognitive development (Davis et al., 2011). A study of adolescent health revealed that the negative impact of stressful life events on health declined as exercise levels increased, suggesting that exercise may be a valuable resource for decreasing stress (Brown & Siegel, 1988). Researchers studying exercise duration and mood state, found that a total of 30 minutes of moderate physical exercise daily improves vigor, fatigue, and total mood (Hansen, Stevens, & Coast, 2001). Longer duration and/or higher intensity of physical activity increase positive affect in depressed persons significantly more than short duration and/or lower intensity physical activity (Mata et al., 2011). Numerous studies have found physical activity significantly reducing the risk of depressive symptoms and risk for major-minor depression in adolescents

(Jerstad, Boutelle, Ness, & Stice, 2010). In Kate Hays book, *Working it out: Using exercise in psychotherapy* (1999), she describes exercise as an important component of a multi-dimensional approach to therapy (Tataryn & Tataryn, 2000). Despite the numerous benefits associated with exercise, one-third of U.S adults and approximately 17% (or 12.5 million) children and adolescents aged 2-19 years are obese (Centers for Disease Control and Prevention). Many factors contribute individuals becoming overweight and obese, but the most common contributing factor is lack of physical activity in individuals.

Much research has been conducted about impulsivity and exercise respectively. Impulsivity is associated with various risk taking behaviors and a negative psychological well-being. In contrast, exercise is associated with health benefits and a positive psychological well-being. However, there has been no research on the association between impulsivity and exercise. Research has found correlations of impulsivity (i.e. depression) to be improved with exercise, but no research has exclusively compared the two constructs, impulsivity and exercise. Through the use of laboratory behavioral assessments and self-measurements, the current study will look at the relationship between impulsive behaviors (i.e., impulsive decision-making, inattention and disnhibition) and exercise in male and female adolescents This research will aid in the understanding of impulsivity and exercise as related constructs. It is hypothesized that adolescents who display more impulsive behaviors will report exercising less than adolescents who display little or no impulsive behaviors.

CHAPTER II

METHOD

Participants

Participants in this study were male and female adolescents recruited from Texas A&M University through the Sona Systems Subject Pool Website. The subjects were students enrolled in an Introduction to Psychology course and received class credit for their participation. Participants in this study aged ranged in age between 17 to 20 years. Further demographic variables are presented in Table 1.

Table 1
Descriptive Statistics of Respondents (N = 39)

Variable	Frequency
Age [years; *M*(*SD*)]	19.1 (1.01)
Ethnicity (n; white:black:hispanic)	33:2:4
Gender (n; male:female)	18:21

Measures

Delayed Discounting Task (DDQ)

The DDQ (Reynolds & Schiffbauer, 2004) is designed to assess delay discounting (i.e., impulsive decision-making) by requiring participants to experience choice consequences during the measurement period. Participants were presented with the question "Would you rather have…" on a computer screen and were given choices between $10 available

after a specified delay (1, 2, 30, 180, or 365 days) and a smaller amount of money available immediately (e.g. 'would you rather have $10 in 30 days or $2 now?). An indifference point value reflects the smallest amount of money an individual chooses to receive immediately instead of the standard delayed amount ($10) at the specified delay. Higher rates of delay discounting (i.e. smaller indifference values) are associated with impulsive decision making. For more description on the DDQ refer to Reynolds & Schiffbauer (2004).

Conners' Continuous Performance Test-II (CPT-II)

The CPT-II (Conners, 2004) is a computerized task designed to measure sustained attention. Participants were presented with various letters flashed one at a time on a computer screen. Participants were asked to left click on a computer mouse every time a letter other than X (target stimulus) was presented and to restrain from clicking when the letter X (nontarget stimulus) was presented. The time between each letter was varied between 1, 2 or 4 seconds and the task lasted approximately 15 minutes. Inattention was indicated when participants experienced high numbers of omission errors (not responding to target stimuli) and/or commission errors (responding to nontarget stimuli) as well as high hit reaction time (slow rate or response).

Go/Stop Task.

The Go/Stop Task (Dougherty et al., 2003) is designed to assess impulsive disinhibition. Participants were presented with a series of three digit numbers on a computer screen

(e.g.,…256…432…432…872) with a 1 second blank screen separating each three digit number. Participants were asked to left click the computer mouse when a matching number (go signal) appeared that was the same as the three digit number appearing directly before. For a randomly selected 25% of the go-signal trials, a second matching number changed colors from black to red. Participants were instructed to refrain from left clicking on the number when the go-signal numbers changed from black to red (stop-signal). The stop signal reaction time (SSRT) was calculated by subtracting the stop signal delay from the go reaction time. Longer SSRT values (measured in milliseconds) reflected behavioral disinhibition and impulsivity.

Godin Leisure-Time Exercise Questionnaire

In the Godin Leisure-Time Exercise Questionnaire, the individual is asked to complete a brief questionnaire of usual leisure-time exercise habits. Participants are asked to indicate how many times per week they average the following kids of exercise for more than 15 minutes: Strenuous Exercise (heart beats rapidly), Moderate Exercise (not exhausting) and Mild Exercise (minimal effort). Total weekly leisure activity is calculated by the following formula: Weekly Leisure Activity Score= (9 X Strenuous) + (5 X Moderate) + (3 X Light).

Procedure

All data collection took place in a human-behavior laboratory at Texas A&M University. Institutional Review Board approved consent and assent forms were reviewed and

signed by all participants before and after their session. Following parental consent/adolescent assent, participants completed a brief demographic questionnaire, the self-report measure, and the Kaufman Brief Intelligence-Second Edition (KBIT2: Kaufman & Kaufman, 2004) used to measure IQ. Following the completion of self-report measures, participants completed the laboratory behaviors tasks. Participants were then debriefed.

CHAPTER III

RESULTS

The linear regression model exploring the association between Weekly Leisure Activity Score and impulsivity measures is summarized in Table 2. There was a significant positive association between the CPT (measuring inattention) and the Weekly Leisure Activity Score (ß= .397, $p < .05$). In addition, there was a significant, positive relationship between the Go Stop (measuring disinhibition) and the Weekly Leisure Activity Score, (ß= .445, $p < .05$). Higher levels of impulsivity in regards to inattention and disinhibition were associated with a higher exercise score. The DDQ (measuring decision making) was not significant in predicting reported exercise activity. The total model of impulsivity (CPT, Go Stop and DDQ) was found to be significant in predicting Weekly Leisure Activity score ($R^2 = .228$, $p < .05$). Impulsive behavior was associated with higher exercise scores. Scores on the behavioral measures remained significantly associated with Weekly Leisure Activity Score both before and after control for age and gender. Table 3 summarizes the descriptive statistics for each measure.

Table 2
Summary of Linear Regression Analysis of Impulsivity measures predicting Weekly Leisure Exercise Score

Variable	*B*	SE *B*	ß	*p* value
CPT_Omiss	.510	.220	.397	.027*
'GoStop_msec	.192	.075	.445	.016*
DDQ	-1.831	6.675	-.045	.786

Note. $R^2 = .228$, $p < .05$ for overall model of impulsivity.
* $p < .05$

Table 3
Descriptive Statistics of Behavioral and Self-Report Measures

Variable	Mean	St.d. Deviation
CPT_Omiss	62.0023	20.49914
GoStop_msec	175.2118	63.94814
DDQ	-1.7961	.71416
Godin_Total	54.7436	26.23549

CHAPTER IV

CONCLUSIONS

When examining the relationship between impulsivity and exercise, significant results were found. The overall model of impulsivity (inattention, disinhibition and decision making) was a significant predictor of Weekly Leisure Activity Score. Specifically, inattention and disinhibition were significant predictors of exercise. Contrary to our hypothesis, there was a positive relationship between impulsivity and exercise. Individuals who displayed high impulsivity reported exercising more than individuals who displayed little or no impulsivity. This may be due to impulsive individuals using exercise to self regulate and counteract their impulsive behaviors. Individuals with high levels of inattention may use exercise as a means of avoiding responsibilities that have delayed consequences, by directing their attention towards some other activity such as exercising. Similarly, Individuals with low levels of disinhibition may use exercise to self regulate and control their inability to inhibit unwanted thoughts or behaviors. Decision making was the only construct of impulsivity that did not predict exercise. Reasons for this may be due to adolescents not considering future consequences when they exercise. Adolescents may be motivated to exercise by the immediate rewards such as appearance and weight management rather than the delayed rewards such as positive health.

There were several limitations in the current study. Participants were all undergraduate students at Texas A&M University. The sample size was small (N=39) and was not diverse in ethnicity and age. The study was not representative of all adolescents because participants aged in range from 17 to 20 years. In addition, there could be a third variable mediating the relationship between exercise and impulsivity, and the data has no means of indicating a third variable. Furthermore, the Godin Leisure-Time Exercise Questionnaire was vague in distinguishing between strenuous, moderate and light exercise and there was much variability in how each participate answered the questions.

The current findings indicate the link between impulsivity and exercise. Future efforts to decrease BMI in individuals may benefit from a better understanding of the relationship between impulsivity and exercise. Researchers interested in exercise and impulsivity should replicate this study using a larger and more diverse sample size. Further insight on the relationship between impulsivity and exercise may be obtained through the use of experimental and control groups to determine if there is a casual relationship between impulsivity and exercise. This may be done through implementing a weekly exercise program in impulsive individuals and measuring their impulsivity after a certain amount of time. Furthermore, it would be important to examine adolescents' motivations to exercise and if motivations vary based on an individual's impulsivity.

This is one of the first studies to look at exercise and impulsivity as related constructs. Inconsistent with our hypothesis, we found that individuals who have high impulsive

behaviors reported exercising more than individuals who have little or no impulsive behaviors. Inattention and disinhibition were significant predictors or exercise. However, it is important to note that this study did not examine possible third variables associated with exercise and impulsivity. Based upon these findings it appears imperative that future research examine the relationship between exercise and impulsivity through experimental methods in order to determine the effects exercise has on impulsivity.

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